

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) An apparatus for humidifying first and second process gas streams, for a fuel cell, the apparatus comprising:

a steam supply line;

a first humidification unit having an inlet for the first process gas stream and a first steam supply means connected to the steam supply line, for supplying steam into the first process gas stream, to add humidity to the first process gas stream at a first temperature, to a humidity in excess of a required humidity level;

a first heat exchanger connected to the first humidification unit, for cooling the first process gas stream to a second, lower temperature, whereby excess moisture in the first process gas stream condenses;

a separator connected to the first heat exchanger, for removing the condensed moisture, whereby the first process gas stream leaving the separator has a known temperature and a known humidity level;

a first heater connected to the separator, for heating the first process gas stream to a third temperature, greater than the second temperature, whereby the process gas stream has a known absolute humidity level;

a second humidification unit including an inlet for the second process gas stream and a second steam supply means connected to the steam supply line, for supplying steam into the second process gas stream, to add humidity to the second process gas stream at a fourth temperature, to a humidity in excess of a required humidity level;

a second heat exchanger connected to the humidification unit, for cooling the second process gas stream to a fifth, lower temperature, whereby excess moisture in the second process gas stream condenses;

a second separator connected to the second heat exchanger, for removing the condensed moisture, whereby the second process gas stream leaving the second separator has a known temperature and a known humidity level;

a second heater connected to the second separator, for heating the second process gas stream to a sixth temperature, greater than the fifth temperature, whereby the second process gas stream has a known absolute humidity level;

wherein the first heater comprises a third heat exchanger and ~~wherein a first common coolant supply is provided for the first and third heat exchangers, wherein each of the first and third heat exchangers is provided with a corresponding first temperature control circuit for controlling the temperature of the corresponding heat exchanger and including a conduit for a fluid, a pump for pumping the fluid and a first cooling means having connections for a first coolant supply, with a first common coolant supply being connected to both of the first cooling means; and~~

wherein the second heater comprises a fourth heat exchanger, wherein each of the second and fourth heat exchangers is provided with a corresponding second temperature control circuit for controlling the temperature of the corresponding heat exchanger and including a conduit for a second fluid, a pump for pumping the second fluid and a second cooling means having connections for a second coolant supply, with a second common coolant supply being connected to both of the second cooling means ~~and wherein a second common coolant supply is provided for the second and fourth heat exchangers.~~

2. (cancelled)

3. (cancelled)

4. (previously amended) An apparatus as claimed in claim 1, which includes at least one of a first outlet line connected to the first heater and a first elongate heating means provided for the first outlet line, for maintaining the first outlet line at the third temperature, and a second outlet line connected to the second heater and a second

elongate heating means provided for the second outlet line, for maintaining the second outlet line at the sixth temperature.

5. (previously presented) An apparatus as claimed in claim 4, where each of the first and the second elongate heating means comprises an elongate electrical heating element.

6. (cancelled)

7. (cancelled)

8. (currently amended) An apparatus as claimed in claim ~~7~~1, wherein at least one of the first temperature control circuits additionally includes one fluid heater for heating the ~~first fluid~~ therein.

9. (cancelled)

10. (cancelled)

11. (previously presented) An apparatus as claimed in claim 21 wherein the steam supply line includes at least one of a shut off valve, a trap for separating out condensed moisture and a pressure regulating valve.

12. (previously presented) An apparatus as claimed in claim 11, wherein the steam line includes two separate lines, one connected to the first-mentioned humidification unit and the other connected to the second humidification unit, wherein each separate steam line includes a shut off valve, a pressure regulating valve and, adjacent the respective steam supply means, a non return valve.

13. (cancelled)

14. (cancelled)

15. (cancelled)

16. (cancelled)

17. (cancelled)

18. (currently amended) An apparatus as claimed in claim ~~17~~8, wherein at least one of the second temperature control circuits additionally includes another fluid heater, for heating the ~~second-fluid~~ therein.

19. (cancelled)

20. (cancelled)

21. (currently amended) An apparatus as claimed in claim ~~20~~1, wherein each of the ~~first, second, third and fourth fluids~~ in the first and second temperature control circuits comprises water, and each of the first and second common coolant supplies comprises a supply of coolant water.

22. (currently amended) An apparatus as claimed in claim ~~1, 17, 19 or 20~~ or 21, wherein each of the steam supply means comprises a steam injector.

23. (new) An apparatus for humidifying a process gas stream, for a fuel cell, the apparatus comprising:

_____ a steam supply line;

_____ a humidification unit having an inlet for the process gas stream and a steam injector connected to the steam supply line, for injecting steam into the process gas stream, to add humidity to the process gas stream at a first temperature, to a humidity well in excess of a required humidity level;;

_____ a first heat exchanger connected to the humidification unit, for cooling the process gas stream to a second, lower temperature, whereby excess moisture in the process gas stream condenses;

_____ a separator for removing the condensed moisture, whereby the process gas stream leaving the separator has a known temperature and a known humidity level;
and

_____ a second heat exchanger connected to the separator, for heating the process gas stream to a third temperature, greater than the second temperature, whereby the process gas stream has a known absolute humidity level;

_____ a first temperature control circuit, for controlling the temperature of the first heat exchanger, the first temperature control circuit comprising a first conduit for a first fluid, a first pump for pumping the first fluid, and a first cooling means for cooling the first fluid, with the first heat exchanger being located in the first conduit;

_____ a second temperature control circuit, for controlling the temperature of the second heat exchanger, the second temperature control circuit comprising a second conduit for a second fluid, a second pump for pumping the second fluid, and a second cooling means for cooling the second fluid, with the second heat exchanger being located in the second conduit; and

_____ a common coolant supply connected to the first and second cooling means.

24. (new) An apparatus as claimed in claim 23, which includes an outlet line connected to the second heat exchanger and an elongate heating means provided for the outlet line, for maintaining the outlet line at the third temperature.

25. (new) An apparatus as claimed in claim 24, where the elongate heating means comprises elongate electrical heating elements.

26. (new) An apparatus as claimed in claim 23, wherein at least one of the first and second cooling circuit additionally includes a further heater for heating the fluid therein.

27. (new) An apparatus as claimed in claim 26 wherein the steam supply line includes at least one of a shut off valve, a trap for separating out condensed moisture and a pressure regulating valve.

28. (new) An apparatus for humidifying a fuel gas stream and an oxidant gas stream for a fuel cell, the apparatus comprising:

a fuel gas humidification unit having an inlet for the fuel gas stream and a first steam injector, for injecting steam into the fuel gas stream, to humidify the fuel gas stream at a first temperature to a humidity well in excess of a required humidity level;

a first, fuel gas heat exchanger connected to the fuel gas humidification unit, for cooling the fuel gas stream to a second, lower temperature, whereby excess moisture in the fuel gas stream condenses;

a fuel gas separator connected to the first fuel gas heat exchanger, for removing the condensed moisture from the fuel gas;

a second, fuel gas heat exchanger connected to the fuel gas separator, for heating the fuel gas stream to a third temperature, greater than the second temperature, whereby the fuel gas stream has a known absolute humidity level;

an oxidant gas humidification unit having an inlet for the oxidant gas stream and a second steam injector, for injecting steam into the oxidant gas stream; to humidify the oxidant gas stream at a third temperature, to a humidity well in excess of a required humidity level;

a third heat exchanger connected to the oxidant gas humidification unit, for cooling the oxidant gas stream to a fourth, lower temperature, whereby excess moisture in the oxidant gas stream condenses;

an oxidant gas separator connected to the third heat exchanger, for removing the condensed moisture, whereby the oxidant gas stream leaving the second separator has a known temperature and a known humidity level; and

a fourth heat exchanger connected to the oxidant gas separator, for heating the oxidant gas stream to a sixth temperature greater than the fifth temperature, whereby the oxidant gas stream has a known absolute humidity level;

wherein the first heater comprises a third heat exchanger, wherein each of the first and third heat exchangers is provided with a corresponding first temperature control circuit for controlling the temperature of the corresponding heat exchanger and including a conduit for a fluid, a pump for pumping the fluid and a first cooling means having connectors for a first coolant supply, with a first common coolant supply being connected to both of the first cooling means; and

wherein the second heater comprises a fourth heat exchanger, wherein each of the second and fourth heat exchangers is provided with a corresponding second temperature control circuit for controlling the temperature of the corresponding heat exchanger and including a conduit for a second fluid, a pump for pumping the second fluid and a second cooling means having connectors for a second coolant supply, with a second common coolant supply being connected to both of the second cooling means.

29. (new) An apparatus as claimed in claim 28, wherein the steam line includes first and second separate lines, the first separate line being connected to the fuel gas humidification unit and the second separate line being connected to the oxidant gas humidification unit, and wherein the steam line includes at least one of a cut off valve, a moisture trap and a pressure regulating valve.

30. (new) An apparatus as claimed in claim 29, wherein each of the first and second separate lines includes a pressure regulating valve, a cut off valve and a non return valve, the non return valve being located immediately adjacent the respective humidification unit.